

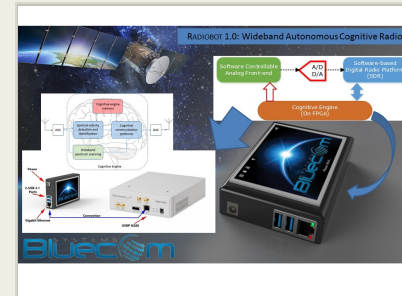
# Wideband Autonomous Cognitive Radios for Networked Satellites Communications, Phase II

Completed Technology Project (2016 - 2018)



## Project Introduction

Wideband Autonomous Cognitive Radios (WACRs) are advanced radios that have the ability to sense state of the RF spectrum and the network and self-optimize its operating mode in response to this sensed state. During the just finished Phase I STTR project, Bluecom Systems was able to develop a comprehensive design for realizing such a WACR and demonstrate the proof-of-concept operation in a hardware-in-the-loop simulation. The developed design consists of three modules: a cognitive engine, a Software-defined radio (SDR) platform and a reconfigurable RF front-end. The key module that makes the radio a WACR is the cognitive engine that acts as the brain of the system. The objective of this Phase II project is to prototype a Space Telecommunications Radio System (STRS)-compliant plug-n-play cognitive engine, called the Radiobot 1.0, that can transform any suitably designed SDR in to a WACR. During Phase II, Bluecom will build on the success of Phase I to develop a suite of algorithms that will make up the cognitive engine: Algorithms for spectrum knowledge acquisition and protocols for cognitive communications. The latter will specifically be aimed at networks formed by clusters of smaller satellites such as CubeSats. Next, these algorithms will be implemented on an FPGA System-on-Chip (SoC). Radiobot 1.0 prototype will be completed by developing a plug-n-play interface between the FPGA-implemented cognitive engine and any STRS-compliant SDR. WACR technology operation will be demonstrated by integrating this Radiobot 1.0 cognitive engine with suitable SDR platforms and in particular those that operate in Ka band. Beyond obvious benefits to NASA in realizing autonomous and intelligent communication networks required to exploit the full potential of networked clusters of CubeSats, Radiobot 1.0 will also find commercial applications in first-responder/emergency/public safety communications, autonomous systems and drones as well as many other military communications.



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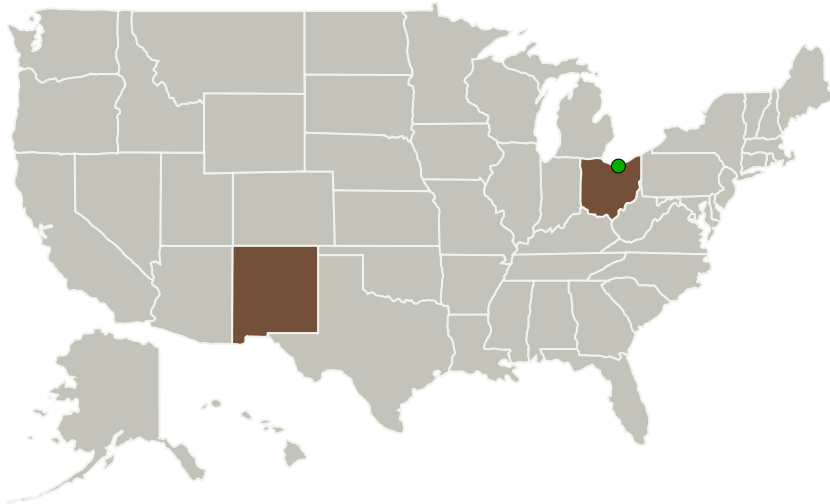
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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Bluecom Systems And Consulting, LLC	Lead Organization	Industry Small Disadvantaged Business (SDB)	Albuquerque, New Mexico
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of New Mexico-Main Campus	Supporting Organization	Academia Hispanic Serving Institutions (HSI)	Albuquerque, New Mexico

### Primary U.S. Work Locations

New Mexico	Ohio
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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

Bluecom Systems And Consulting, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

Carlos Torrez

### Principal Investigator:

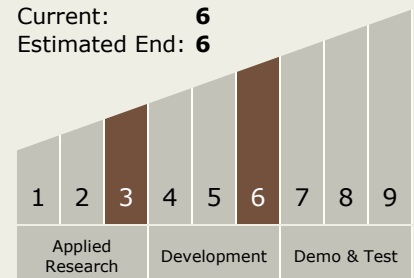
Christos Christodoulou

## Technology Maturity (TRL)

Start: 3

Current: 6

Estimated End: 6



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## Project Transitions



**November 2016:** Project Start



**October 2018:** Closed out

### Closeout Documentation:

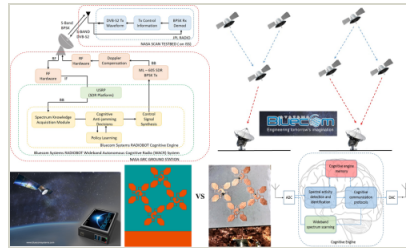
- Final Summary Chart(<https://techport.nasa.gov/file/140809>)

## Images



### Briefing Chart Image

Wideband Autonomous Cognitive Radios for Networked Satellites Communications, Phase II  
(<https://techport.nasa.gov/image/132118>)



### Final Summary Chart Image

Wideband Autonomous Cognitive Radios for Networked Satellites Communications, Phase II  
(<https://techport.nasa.gov/image/128526>)

## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.5 Revolutionary Communications Technologies
    - TX05.5.1 Cognitive Networking

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System